

**Encapsulating Suit Systems
“The Total System Concept”**

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The world of personal protective equipment remains to be a complicated maze of products that are defined by standards, performances, and their manufacturers, each having their own distinctive characteristics. The truth of the matter is, that when you observe an individual who is dressed out to perform a job function, he is usually wearing a multitude of permutations and combinations of products that have met with the budgeted requirements of process industries, combined with the level of protection that the individual component brings to the table. Although these products are bringing a so-called solution to the individual wearer, there still exists a problem that is commonplace. A piece of TYVEK clothing will protect the wearer from common particles and an occasional chemical splash. A full-face respirator will supply a protection factor so that the individual can work safely. But can the elements of “Safety” be further improved? Have we analyzed the personal protective envelope as a “Whole”, and have we thoroughly determined the overall risk associated with the parameters of concern. Although health and safety managers, health physicists, and industrial hygienists regularly deal with the risk, and support the selection of various PPE, there still remains a question as to how the products work together as a single unit to afford maximum protection to the user. In a so-called “High Risk” application, it has become increasingly evident that there is the need to marry and bring together the, “Quadrants of Performance” to the user, in a singular systems approach that minimizes the risk, and affords maximum protection, comfort, mobility, durability and performance to the user. The quadrants of performance are best described as the following; respiratory protection, contamination control, heat stress reduction, and man power safety.

The ideal approach to total protection has been to apply many products that will generate the overall solution. A respirator, coverall, gloves and boots were the typical order of the day and seemed to perform admirably. But have all the personal performance concerns been addressed. These four (4) products have been brought together to work as a team. This typically, can create problems for users. Respirators must fit correctly, gloves must be interfaced with the coverall, and then, in order to secure the interface from contamination, we apply adhesive tape to insure that they fit together. To make matters worse, we eventually must apply drastic measures to de-gown the individual by, cutting out” the individual, all at the risk of injury and personal contamination events. All this takes away precious time from the individual, and if the job is “Critical Path” in nature, can have negative effects on the overall project. Surely there must be a better way.

Although, in an ideal world, the use of engineered controls to reduce the risk, presents the best solution, they may not always be the most practical and affordable. The best way to ultimately afford whole body protection to the worker is to encapsulate him, thus creating a controlled environment, and shielding him from the sources of contamination that exist in the work area. The typical “Bubble Suit” has been portrayed as a slow moving individual incapable of high on the job performance. This does not have to be the case if you explore the availability of high performance products that exist today. Most products offer solutions that address one aspect of performance, but typically fall short in offering

you the total package. An individual, responsible for PPE must source various products in order to accomplish full body protection, which addresses all quadrants of performance. Encapsulating Suits or “Bubble Suits” can marry the “Quadrants of Performance” best by bringing you a single product that acts as a respirator, offers you whole body protection, and most importantly comes in lightweight packages that offer exceptional mobility, and heat stress reducing properties. The engineering of “Encapsulating Suit Systems” does not stop there. The best of products developed, focus in on giving the user flexibility of performance. Supplied air suits and “Self Fed” air suits through blowing units, generate variable flow and pressure from the end user, and still perform and maximize respiratory protection, and full body cooling. Controlled exhaust valve technology insure that the suits are in “Positive Pressure Mode” at all times, independent of the process evolution. You can be crawling, reaching, bending, and yet the suits overpressure remains in effect thus eliminating the chance of internal leakage of airborne contamination. Ideally in a high- risk environment, the challenge is to engineer products that offer positive pressure. To simply engineer suits with positive pressure is easy, but it comes with it’s own series of responsibilities. The overpressure must be controlled, in order to reduce the so- called “Michelin-Man” effect. They must be over-pressurized, offer high airflow, but this must be managed so that the suits are close to the body wear-by maximizing mobility, and safety are achieved. The suits should be tested under rigorous standards that insure that CO₂ concentrations at the breathing zone are kept to a minimum, even under severe work conditions. Products must insure that high visibility is accomplished as well. Suit designs must address the ergonomics afforded by the human anatomy. One size fits all will not work here. In addition, advanced safety features are built- in, enabling the user to self-escape in case of supplied air loss. Critical path concerns are addressed by enabling the job function to be performed quickly, with minimum chance of personal contamination. Interface concerns between products such as gloves to coveralls, and coveralls to respirators must be eliminated. This can only be accomplished through total encapsulation. Gowning and de-gowning processes must be fast, resulting in no time lost, and literally eliminating the chance for contamination.

In summary, there are many products that are available to the industry involving personal protective equipment. To the naked eye, what we see may not be what exists. Although there are many applications where the use of conventional respirators, coveralls etc are needed as standard equipment, there presently exists an application area whereby the need for whole body protection exists. In addition, there are countless applications that require the need for efficient heat stress reduction. At present typical solutions involve the use of respirators and/or face shields, plastic coveralls, gloves and boots. When all the risk factors are assessed, and time is of the essence, you may find that a well engineered “Encapsulating Suit System”, may give you the piece of mind that both health and safety personnel and senior management are looking for to get the job done safely, efficiently, and most importantly without incident.